

CLAIMS

We claim:

1. An electrostatic fluid accelerator, which comprises:
a multiplicity of closely spaced corona electrodes; and
at least one exciting electrode asymmetrically located between said corona electrodes.
2. The electrostatic fluid accelerator as recited in claim 1, wherein:
the voltage between said corona electrodes and said exciting electrodes is maintained between the corona onset voltage and the breakdown voltage.
3. The electrostatic fluid accelerator as recited in claim 2, wherein:
the voltage between said corona electrodes and said exciting is controlled by a flexible top high-voltage power supply.
4. The electrostatic fluid accelerator as recited in claim 3, wherein:
said exciting electrode is a plate or set of plates that extend downstream with respect to the desired direction of fluid flow.
5. The electrostatic fluid accelerator as recited in claim 4, further comprising:
one or more additional electrostatic fluid accelerators as recited in claim 4, each of said additional electrostatic fluid accelerators being located downstream, with respect to the desired direction of fluid flow, from said preceding electrostatic fluid accelerator; and
at least one collecting electrode located between at least one pair of said electrostatic fluid accelerators.
6. The electrostatic fluid accelerator as recited in claim 3, further comprising:
one or more additional electrostatic fluid accelerators as recited in claim 3, each of said additional electrostatic fluid accelerators being located downstream, with respect to the desired direction of fluid flow, from said preceding electrostatic fluid accelerator; and
at least one collecting electrode located between at least one pair of said electrostatic fluid accelerators.

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1 7. The electrostatic fluid accelerator as recited in claim 2, wherein:
2 said exciting electrode is a plate that extends downstream with respect to the
3 desired direction of fluid flow.

1 8. The electrostatic fluid accelerator as recited in claim 7, further comprising:
2 one or more additional electrostatic fluid accelerators as recited in claim 7, each of
3 said additional electrostatic fluid accelerators being located downstream, with respect to
4 the desired direction of fluid flow, from said preceding electrostatic fluid accelerator; and
5 at least one collecting electrode located between at least one pair of said
6 electrostatic fluid accelerators.

1 9. The electrostatic fluid accelerator as recited in claim 2, further comprising:
2 one or more additional electrostatic fluid accelerators as recited in claim 2, each of
3 said additional electrostatic fluid accelerators being located downstream, with respect to
4 the desired direction of fluid flow, from said preceding electrostatic fluid accelerator; and
5 at least one collecting electrode located between at least one pair of said
6 electrostatic fluid accelerators.

1 10. The electrostatic fluid accelerator as recited in claim 1, wherein:
2 the voltage between said corona electrodes and said exciting electrodes is
3 variable, even outside the range between the corona onset voltage and the breakdown
4 voltage.

1 11. The electrostatic fluid accelerator as recited in claim 10, wherein:
2 said exciting electrode is a plate that extends downstream with respect to the
3 desired direction of fluid flow.

1 12. The electrostatic fluid accelerator as recited in claim 11 further comprising:
2 one or more additional electrostatic fluid accelerators as recited in claim 11, each
3 of said additional electrostatic fluid accelerators being located downstream, with respect
4 to the desired direction of fluid flow, from said preceding electrostatic fluid accelerator;
5 and
6 at least one collecting electrode located between at least one pair of said
7 electrostatic fluid accelerators.

1 13. The electrostatic fluid accelerator as recited in claim 10 further comprising:
2 one or more additional electrostatic fluid accelerators as recited in claim 10, each
3 of said additional electrostatic fluid accelerators being located downstream, with respect
4 to the desired direction of fluid flow, from said preceding electrostatic fluid accelerator;
5 and

6 at least one collecting electrode located between at least one pair of said
7 electrostatic fluid accelerators.

8 14. An electrostatic fluid accelerator, which comprises:
9 a multiplicity of closely spaced corona electrodes;
10 at least one exciting electrode located between said corona electrodes; and
11 at least one accelerating electrode.

12 15. The electrostatic fluid accelerator as recited in claim 14, wherein:
13 the voltage between said corona electrodes and said accelerating electrodes is
14 maintained between the corona onset voltage and the breakdown voltage.

15 16. The electrostatic fluid accelerator as recited in claim 14, wherein:
16 the voltage between said corona electrodes and said exciting electrodes is
17 maintained between the corona onset voltage and the breakdown voltage.

18 17. The electrostatic fluid accelerator as recited in claim 16, wherein:
19 the accelerating electrode is an attracting electrode, said attracting electrode
20 having opposite electrical polarity to that of said corona electrodes and said attracting
21 electrode being located, with respect to the desired direction of fluid flow, downstream
22 from said corona electrodes.

23 18. The electrostatic fluid accelerator as recited in claim 17, wherein:
24 the voltage between said corona electrodes and said exciting electrode is
25 controlled by a flexible top high-voltage power supply.

26 19. The electrostatic fluid accelerator as recited in claim 18, wherein:
27 said exciting electrode is a plate that extends downstream with respect to the
28 desired direction of fluid flow.

20. The electrostatic fluid accelerator as recited in claim 19, further comprising:
one or more additional electrostatic fluid accelerators as recited in claim 19, each
of said additional electrostatic fluid accelerators being located downstream, with respect
to the desired direction of fluid flow, from said preceding electrostatic fluid accelerator;
and

at least one collecting electrode located between at least one pair of said
electrostatic fluid accelerators.

21. The electrostatic fluid accelerator as recited in claim 18, further comprising:
one or more additional electrostatic fluid accelerators as recited in claim 18, each
of said additional electrostatic fluid accelerators being located downstream, with respect
to the desired direction of fluid flow, from said preceding electrostatic fluid accelerator;
and

at least one collecting electrode located between at least one pair of said
electrostatic fluid accelerators.

22. The electrostatic fluid accelerator as recited in claim 17, wherein:
said exciting electrode is a plate that extends downstream with respect to the
desired direction of fluid flow.

23. The electrostatic fluid accelerator as recited in claim 22, further comprising:
one or more additional electrostatic fluid accelerators as recited in claim 22, each
of said additional electrostatic fluid accelerators being located downstream, with respect
to the desired direction of fluid flow, from said preceding electrostatic fluid accelerator;
and

at least one collecting electrode located between at least one pair of said
electrostatic fluid accelerators.

24. The electrostatic fluid accelerator as recited in claim 17, further comprising:
one or more additional electrostatic fluid accelerators as recited in claim 17, each
of said additional electrostatic fluid accelerators being located downstream, with respect
to the desired direction of fluid flow, from said preceding electrostatic fluid accelerator;
and

6 at least one ~~collecting~~ electrode located between at least one pair of said
7 electrostatic fluid accelerators.

1 ~~23.~~ The electrostatic fluid accelerator as recited in claim ~~16~~¹³, wherein:

2 the accelerating electrode is a repelling electrode, said repelling electrode having
3 the same electrical polarity as that of said corona electrodes and said repelling electrode
4 being located, with respect to the desired direction of fluid flow, upstream from said
5 corona electrodes.

1 26. The electrostatic fluid accelerator as recited in claim 25, wherein:

2 the voltage between said corona electrodes and said exciting electrode is
3 controlled by a flexible top high-voltage power supply.

1 27. The electrostatic fluid accelerator as recited in claim 26, wherein:

2 said ~~exciting~~ electrode is a plate or set of plates that extends downstream with
3 respect to the desired direction of fluid flow.

1 28. The electrostatic fluid accelerator as recited in claim 27, further comprising:

2 one or more additional electrostatic fluid accelerators as recited in claim 27, each
3 of said additional electrostatic fluid accelerators being located downstream, with respect
4 to the desired direction of fluid flow, from said preceding electrostatic fluid accelerator;
5 and

6 at least one collecting electrode located between at least one pair of said
7 electrostatic fluid accelerators.

1 29. The electrostatic fluid accelerator as recited in claim 26, further comprising:

2 one or more additional electrostatic fluid accelerators as recited in claim 26, each
3 of said additional electrostatic fluid accelerators being located downstream, with respect
4 to the desired direction of fluid flow, from said preceding electrostatic fluid accelerator;
5 and

6 at least one collecting electrode located between at least one pair of said
7 electrostatic fluid accelerators.

1 ²⁹20. The electrostatic fluid accelerator as recited in claim ²⁰25, wherein:
2 said exciting electrode is a plate that extends downstream with respect to the
3 desired direction of fluid flow.

1 ³¹31. The electrostatic fluid accelerator as recited in claim 30, further comprising:
2 one or more additional electrostatic fluid accelerators as recited in claim 30, each
3 of said additional electrostatic fluid accelerators being located downstream, with respect
4 to the desired direction of fluid flow, from said preceding electrostatic fluid accelerator;
5 and
6 at least one collecting electrode located between at least one pair of said
7 electrostatic fluid accelerators.

1 32. The electrostatic fluid accelerator as recited in claim 25, further comprising:
2 one or more additional electrostatic fluid accelerators as recited in claim 25, each
3 of said additional electrostatic fluid accelerators being located downstream, with respect
4 to the desired direction of fluid flow, from said preceding electrostatic fluid accelerator;
5 and
6 at least one collecting electrode located between at least one pair of said
7 electrostatic fluid accelerators.

1 33. The electrostatic fluid accelerator as recited in claim 14, wherein:
2 the voltage between said corona electrodes and said exciting electrodes is
3 variable, even outside the range between the corona onset voltage and the breakdown
4 voltage.

1 ³⁴34. The electrostatic fluid accelerator as recited in claim ³⁴33, wherein:
2 the accelerating electrode is an attracting electrode, said attracting electrode
3 having opposite electrical polarity to that of said corona electrodes and said attracting
4 electrode being located, with respect to the desired direction of fluid flow, downstream
5 from said corona electrodes.

1 35. The electrostatic fluid accelerator as recited in claim 34, wherein:
2 said exciting electrode is a plate that extends downstream with respect to the
3 desired direction of fluid flow.

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36. The electrostatic fluid accelerator as recited in claim 35 further comprising:
one or more additional electrostatic fluid accelerators as recited in claim 35, each
of said additional electrostatic fluid accelerators being located downstream, with respect
to the desired direction of fluid flow, from said preceding electrostatic fluid accelerator;
and

at least one collecting electrode located between at least one pair of said
electrostatic fluid accelerators.

37. The electrostatic fluid accelerator as recited in claim 34 further comprising:
one or more additional electrostatic fluid accelerators as recited in claim 34, each
of said additional electrostatic fluid accelerators being located downstream, with respect
to the desired direction of fluid flow, from said preceding electrostatic fluid accelerator;
and

at least one collecting electrode located between at least one pair of said
electrostatic fluid accelerators.

38. The electrostatic fluid accelerator as recited in claim 38, wherein:
the accelerating electrode is a repelling electrode, said repelling electrode having
the same electrical polarity as that of said corona electrodes and said repelling electrode
being located, with respect to the desired direction of fluid flow, upstream from said
corona electrodes.

39. The electrostatic fluid accelerator as recited in claim 38, wherein:
said exciting electrode is a plate that extends downstream with respect to the
desired direction of fluid flow.

40. The electrostatic fluid accelerator as recited in claim 39 further comprising:
one or more additional electrostatic fluid accelerators as recited in claim 39, each
of said additional electrostatic fluid accelerators being located downstream, with respect
to the desired direction of fluid flow, from said preceding electrostatic fluid accelerator;
and

at least one collecting electrode located between at least one pair of said
electrostatic fluid accelerators.

1 41. The electrostatic fluid accelerator as recited in claim 38 further comprising:
2 one or more additional electrostatic fluid accelerators as recited in claim 38, each
3 of said additional electrostatic fluid accelerators being located downstream, with respect
4 to the desired direction of fluid flow, from said preceding electrostatic fluid accelerator;
5 and

6 at least one collecting electrode located between at least one pair of said
7 electrostatic fluid accelerators.

1 42. An electrostatic fluid accelerator, which comprises:

2 any corona discharge device that is well known in the art for moving a fluid;

3 one or more additional corona discharge devices that are well known in the art for
4 moving a fluid, each of said additional corona discharge devices being located
5 downstream, with respect to the desired direction of fluid flow, from said preceding
6 corona discharge device; and

7 at least one collecting electrode located between at least one pair of said
8 electrostatic fluid accelerators.

1 43. A flexible top high-voltage power supply, which comprises:

2 a base unit that produces a voltage which is only slightly sensitive to the output
3 current of the power supply;

4 a second unit that produces an output voltage which decreases with increasing
5 output current from the power supply; and

6 a means for combining the voltages from said base unit and said second unit.

1 44. A device employing electrodes, which comprises:

2 a set of electrodes capable of producing a corona discharge; and

3 a flexible top high-voltage power supply electrically connected to said set of
4 electrodes.

1 45. The device employing electrodes as recited in claim 44, wherein:

2 at least one set of electrodes is located in a separate frame having an opening for
3 free fluid passage.

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Attorney's Docket No. PFUHRI

PATENT

COMBINED DECLARATION AND POWER OF ATTORNEY

(ORIGINAL, DESIGN, NATIONAL STAGE OF PCT, SUPPLEMENTAL, DIVISIONAL,
CONTINUATION OR C-I-P)

As a below-named inventor, I hereby declare that:

TYPE OF DECLARATION

This declaration is of the following type: original declaration

INVENTORSHIP IDENTIFICATION

My residence, post office address, and citizenship are as stated below next to my name. I believe I am an original, first, and joint inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled:

TITLE OF INVENTION

Electrostatic Fluid Accelerator

SPECIFICATION IDENTIFICATION

the specification of which is attached hereto.

ACKNOWLEDGMENT OF REVIEW OF PAPERS AND DUTY OF CANDOR

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 Code of Federal Regulations § 1.56.

PRIORITY CLAIM (35 U.S.C. § 119)

I hereby claim foreign priority benefits under Title 35 United States Code § 119 of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the

United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed.

No such applications have been filed.

**CLAIM FOR BENEFIT OF EARLIER U.S. APPLICATION UNDER
35 U.S.C. 120**

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s) that is/are listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of Title 35, United States Code, I acknowledge the duty to disclose information that is material to the examination of this application, namely, information where there is substantial likelihood that a reasonable Examiner would consider it important in deciding whether to allow the application to issue as a patent, which occurred between the filing date of the prior application(s) and the national filing date of this application.

U. S. provisional application serial no. 60/104,573, filed on 10/16/1998

POWER OF ATTORNEY

I hereby appoint the following attorney to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

Thompson E. Fehr
Registration No. 31,353

SEND CORRESPONDENCE TO:

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The Aerospace Center
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Ogden, Utah 84403

DIRECT TELEPHONE CALL TO:

Thompson E. Fehr
(801) 393-6292

DECLARATION

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States

Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

SIGNATURES

Full name of first inventor: Igor A. Krichtafovitch

Inventor's signature Igor A. Krichtafovitch

Date: 10.14.1999

Country of Citizenship: The Ukraine

Residence: Bothell, Washington

Post Office Address: 822 233rd Street, S. E.
Bothell, Washington 98021

Full name of second joint inventor: Robert L. Fuhriman, Jr.

Inventor's signature Robert L. Fuhriman, Jr.

Date: 10-14-99

Country of Citizenship: United States of America

Residence: Bellevue, Washington

Post Office Address: 13910 S. E. 23rd Street
Bellevue, Washington 98005

This declaration ends with this page.

Express Mail Label No. EJ792102413US

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Igor A. Krichtafovitch and Robert L. Fuhriman, Jr.

Serial No.:

Filed:

For: Electrostatic Fluid Accelerator

Group Art Unit:

Examiner:

Attorney Docket No.: PFUHRI

**VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY
STATUS (37 CFR 1.9(f) AND 1.27(b))--INDEPENDENT INVENTOR**

As a below-named inventor, I hereby declare that I qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees under Section 41(a) and (b) of Title 35, United States Code, to the Patent and Trademark Office with regard to the invention entitled Electrostatic Fluid Accelerator described in the specification filed herewith.

I have not assigned, granted, conveyed, or licensed and am under no obligation under contract or law to assign, grant, convey, or license, any rights in the invention to any person who could not be classified as an independent inventor under 37 CFR 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern, or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:

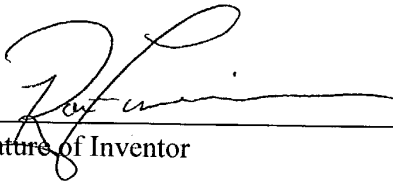
High Voltage Integrated
13910 S. E. 23rd Street
Bellevue, Washington 98005

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b)).

VERIFIED STATEMENT (DECLARATION)
CLAIMING SMALL ENTITY STATUS (37 CFR
1.9(f) AND 1.27(b))--INDEPENDENT INVENTOR

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

Robert L. Fuhriman, Jr.
Inventor



Signature of Inventor

Date: 10-14-99

Express Mail Label No. EJ792102413US

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Igor A. Krichtafovitch and Robert L. Fuhriman, Jr.
Serial No.:
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Group Art Unit:
Examiner:
Attorney Docket No.: PFUHRI

**VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY
STATUS (37 CFR 1.9(f) AND 1.27(b))--INDEPENDENT INVENTOR**

As a below-named inventor, I hereby declare that I qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees under Section 41(a) and (b) of Title 35, United States Code, to the Patent and Trademark Office with regard to the invention entitled Electrostatic Fluid Accelerator described in the specification filed herewith.

I have not assigned, granted, conveyed, or licensed and am under no obligation under contract or law to assign, grant, convey, or license, any rights in the invention to any person who could not be classified as an independent inventor under 37 CFR 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern, or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:

High Voltage Integrated
13910 S. E. 23rd Street
Bellevue, Washington 98005

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b)).

VERIFIED STATEMENT (DECLARATION)
CLAIMING SMALL ENTITY STATUS (37 CFR
1.9(f) AND 1.27(b))--INDEPENDENT INVENTOR

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Igor A. Krichtafovitch and Robert L. Fuhriman, Jr.

Serial No.:

Filed:

For: Electrostatic Fluid Accelerator

Group Art Unit:

Examiner:

Attorney Docket No.: PFUHRI

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY
STATUS (37 CFR 1.9(f) AND 1.27(c))--SMALL BUSINESS CONCERN

I hereby declare that I am an official of the small business concern empowered to act on behalf of the concern identified below:

High Voltage Integrated
13910 S. E. 23rd Street
Bellevue, Washington 98005

I hereby declare that the above-identified small business concern qualifies as a small business concern as defined in 13 CFR 121.1301-1305, and reproduced in 37 CFR 1.9(d), for purposes of paying reduced fees under Section 41(a) and (b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time, or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third-party or parties controls or has the power to control both.

I hereby declare that rights under contract or law have been conveyed to, and remain with, the small business concern identified above with regard to the invention entitled Electrostatic Fluid Accelerator by inventors Igor A. Krichtafovitch and Robert L. Fuhriman, Jr. described in the specification filed herewith.

If the rights held by the above-identified small business concern are not exclusive, each individual, concern, or organization having rights in the invention is listed below; and no rights

VERIFIED STATEMENT (DECLARATION)
CLAIMING SMALL ENTITY STATUS (37 CFR
1.9(f) AND 1.27(c))--SMALL BUSINESS CONCERN

to the invention are held by any person, other than the inventor, who would not qualify as an independent inventor under 37 CFR 1.9(c) if that person made the invention, or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

NAME _____

ADDRESS _____

___ INDIVIDUAL X SMALL BUSINESS CONCERN

___ NONPROFIT ORGANIZATION

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small business entity is no longer appropriate. (37 CFR 1.28(b)).

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

NAME OF PERSON SIGNING: Ingrid T. Fuhrman

TITLE OF PERSON OTHER THAN OWNER: VICE PRESIDENT

ADDRESS OF PERSON SIGNING: 13910 SE 23rd St
Bellevue, WA 98005

SIGNATURE Ingrid T. Fuhrman

Date: 10-14-44

VERIFIED STATEMENT (DECLARATION)
CLAIMING SMALL ENTITY STATUS (37 CFR
1.9(f) AND 1.27(c))--SMALL BUSINESS CONCERN